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REVIEW: WIRELESS PATIENT MONITORING SYSTEM & ITS PERFORMANCE EVALUATION

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ABSTRACT

Care taking systems for elderly population have made patient monitoring an important area of research. Medical evaluation in these systems uses wireless technologies to transmit vital signs.This paper strives to implement a prototype to enhance performance of patient monitoring system. Proposed system measures physical parameters like heartbeat and body temperature of the patient.This work is motivated by developing an efficient wireless biometric system that simultaneously monitors multiple health parameters at a given time and transmit this information to patient monitoring system to store it permanently for future analysis. Based on this performance evaluation of sensors can be done. Although wide range of techniques are available for ICU patient's health monitoring using wired systems but this work provides a novel system where wireless sensor networks are deployed to monitor health parameters and the acquired data is transmitted to server. Zig bee wireless sensor networks are used to achieve our purpose. A buzzer is raised and the discomfort signal is communicated to the doctor through GSM module if a patient is found with abnormality.

KEYWORDS: Wireless Sensor Networks, Multiple Health Parameters, Sensors, Patient Monitoring System

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Original Article

INTRODUCTION

In research, scientific and technological community, Wireless sensors and sensor network are of great interest [01]. Due to growth in technology and a corresponding inactive lifestyle, need for well-equipped hospitals and diagnosis centers have increased in current era. Continuous monitoring has become a necessity for accurate analysis and treatment of a given patient. It also creates an opportunity for skilled doctors and nurses to be available for multiple patients simultaneously. Keeping all these aspects in the mind we will develop "wireless biometric patient monitoring system".

ICU admitted Patient need continuous monitoring of their physiological parameters such as measurement of temperature, heart rate, blood pressure, ECG, EEG etc. and transmitting this data to the doctor's cabin continuously. Proposed method in this paper continuously monitors heartbeat and body temperature of a patient. These two parameters are very critical ones as these are prominent parameters that get affected when a person is afflicted by a disease. Body temperature is an important and a regulated physiological parameter. Heart rate gives insight into the effort a patient's body is expending. Here, we are using Zig bee for wireless transmission [02]. Zig bee receiver module continuously updates database of personal computer available at doctor's desk. Hence it

requires a single click for a doctor to access complete information of a patient's history as well as current status. In absence of doctor a skilled and experienced nurse can forward information updated in database to doctor's mobile instantaneously [03], and at the same time critical and important decisions can be taken in the absence of a doctor.

Drawback of Traditional System

The traditional health monitoring systems were having some drawbacks as follows:-

- Difficulty in monitoring patient
- connection of many instruments are tedious process
- difficulty in monitoring patient body temperature by thermometer
- Heart beat is measured manually
- Long measurement time
- Low monitor precision
- Any one of the parameter is taken and measured
- Como patients should be monitored closely in person

Advantages of our Exiting System

In exiting system of patient health care were having some advantages as follows:

- Eliminates the manual system measurements and monitoring processes
- Temperature measurement has high accuracy
- The patient status is sent effectively to the doctor via SMS
- Very instantly the status of the patient is monitored with high accuracy
- All the parameters are embedded in to single system which easy to handle by a normal person

LITERATURE SURVEY

Many systems are introduced in the literature for patients monitoring system. A two-tier clinical warning system was proposed for hospitalized patients in [04]. It consists of early warning system (EWS) – This system uses EMR (Electronic medical record) data in which algorithms are used to identify at-risk patients in real time. Mobile patient monitoring systems, which integrate current personal digital assistant (PDA) technology, were used in [05] and [06]. It used Wireless LAN with PDA and proposes a possibility of integrating Bluetooth technology [07].

Recently Zig bee technology has gained widespread use in health care monitoring applications. It is the wireless protocol technology that addresses the dual demands of remote monitoring as well as sensor network application in it. It allows us to deploy low cost and power friendly solutions without replacement of batteries for many years. It operates on IEEE 802.15.4 physical radio specification. Depending on current power operation and type of power source sensor modules are designed and programmed to operate on low power. Review of technologies on wireless sensors and their data transmission use in intensive care unit were given in [08].

EXITING SYSTEM

There are inherent problems with existing systems as they are wireless. To name a few – when the distance between patient being monitored and the monitoring system is more, huge size and a patient health parameters cannot be monitored once he/she is discharged. Hence these systems cannot be used at an individual level. Therefore to overcome these difficulties we propose a new system based on Zig bee which is a Wireless Networking technology which is an established standard for Wireless Personal Area Networks to monitor data continuously and allows us to monitor a patient immediately [09]. If a patient's condition gets worse this system can constantly measure critical parameters of a patient and can alert doctors, nurses and closed ones, this can really provide quick service and be beneficial in saving a lot of lives.

PROPOSED SYSTEM

The proposed system monitors multiple health parameters of a given patient like – blood pressure, temperature, ECG, EEG etc. Processed data of these parameters is compared with a threshold limit and is transmitted to the patient monitoring system available at a doctor's room. This data is also shared with the monitoring system located at nurse room. A unique ID is given to every patient and thus a doctor identifies a particular patient using this ID to form a effective course of corrective actions. A nurse can send monitored data and status of a particular patient to doctor's mobile wirelessly if he is unavailable or is far away with another assignment. Thus this work allows simultaneous monitoring of multiple parameters of multiple patients at a same time.

The various components of proposed system consists of Sensors attached to the body of patient, Signal conditioning section, Patient monitoring system & Doctors/nurse mobile phone. The various sensors used are blood pressure sensor, temperature sensor, SPO2 (pulse oximeter), ECG and EEG sensor etc. In this paper, we concentrate on the temperature sensors & heart beat sensor for monitoring of multiple patients.

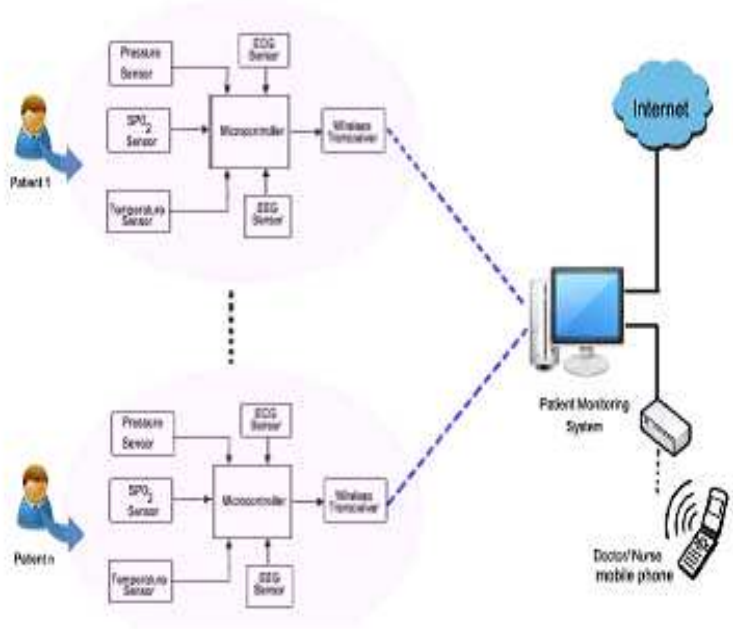

Figure 1: Basic Architecture of Patient Monitoring System

Also in addition to the system, we have performance Evaluation of different sensors so that the monitored data should be more Accurate & precise. It's beneficial to the patient that effective & accurate delivery of the information to the

monitoring system is achieved. So that doctor will come & see the patient. Thus the necessary health aid can be provided and once the doctor arrives the results of concerned patients can be checked. This project proposes a system that provides a continuous health monitoring service for people.

Efficiency and quality of a medical administration is greatly enhanced by it. Doctor in charge can receive a message on his programmed phone regarding patient's health using a GSM modem [10]. Performance of sensor can be evaluated by certain factor.

HARDWARE DESCRIPTION

It includes sensors like Temperature sensor & Heart beat sensor, PIC microcontroller, RFID Tag & Reader, buzzer, and Zig bee connector circuit. The proposed circuit has the ability to determine the patient's temperature in real-time status inside the hospital. Heart beat sensor is designed to give digital output of heart beat when a finger is placed inside the clip. The output from Heart beat sensor is connected to microcontroller directly where Beats per Minute (BPM) rate can be measure.

Zig bee is "Wireless Networking Technology" and is an established set of specifications for wireless personal area networking. Zig bee indoors can usually reach 400 m range. The PIC microcontroller offers high performance and very low power consumption. RFID Tag specify the unique identification of patient. Spontaneous and accurate decisions are inherent demands for a treatment of critically ill patient, so that lifesaving therapies can be applied effectively. Current statistics reveal that every minute a human being is losing his/her life.

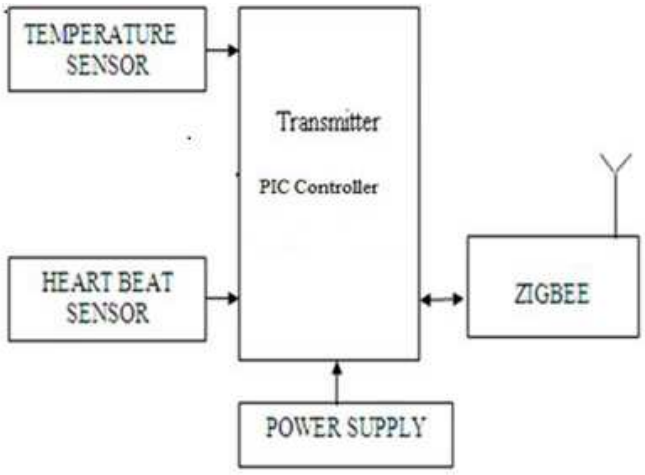

Figure 2: Block Diagram of Transmitter

Microcontroller transmits important parameters converted to digital form using zig bee module. Thus it is not necessary for a PC to be placed near monitoring system; it can be placed far away but within the range of zig bee. Received signals are thus fed into PC with the help of serial communication using COM port

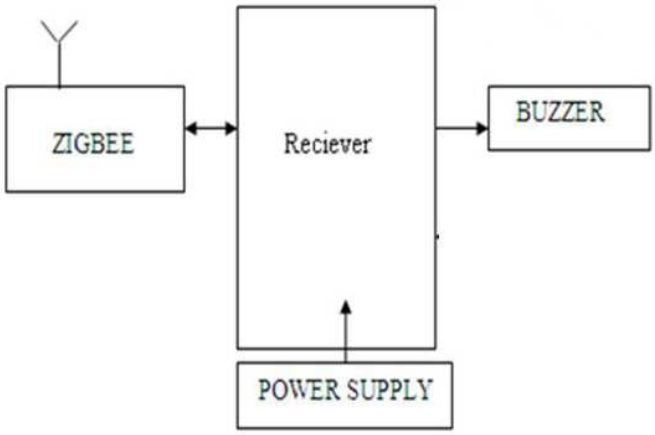

Figure 3: Block Diagram of Receiver

Real time data of parameters of patient's health can be sent. Wireless transmission of these parameters is done using Zig bee. This project tackles problem implementing a monitoring system in medical applications using GSM technology. Apart from accurate and safe monitoring this system also aids in freedom of movement. Temperature and heart beat when monitored are in analog form, but to transmit it wirelessly we convert it to digital form using ADC & message will be transmit through GSM modem

CONCLUSIONS

In this paper, we can conclude that we are able to transmit the data which is sensed from remote patient to the doctor's PC by using wireless transmission technology, Zig bee. In this proposed system of monitoring physiological parameters such as temperature, heartbeat are more powerful than currently available system as wireless biomedical monitoring system provides accurate and fast user authentication. The performances of temperature and heartbeat sensors will be measured and evaluated. Wireless systems are inherently cost efficient. Hence once such systems become a common practice patient monitoring systems will extensively reduce discomfort that is caused by wired systems to a patient. Continuous monitoring of parameters of many patients simultaneously takes this application of wireless transmission to a new level altogether. It pacifies the ease of diagnosis. Remote monitoring and performing judicial decisive actions of critically ill patients is an unmatched boon of such systems. Such novel ideas promote reduction of cost, efforts and time when compared to the traditional systems where one has to make many visits to a hospital.

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